RESEARCH FOR BETTER CROP PRODUCTION

A Summary and Outline of the Recent Undertakings and Accomplishments, the Functions, and the Organization of the Bureau of Plant Industry, Soils, and Agricultural Engineering

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RESEARCH TO INCREASE CROP PRODUCTION is a deeper concern of the American public now than it ever has been before. War emergencies have multiplied needs and created shortages. The prospects of peace, whether near or distant, have aroused hopes for a world more nearly free from want. These needs and these hopes have stimulated an unparalleled interest in the possibilities of discovering and demonstrating through research the ways and means for producing more and better crops at lower cost.

Among the agencies of Government conducting such research is the Bureau of Plant Industry, Soils, and Agricultural Engineering, with headquarters at Beltsville, Md., and with field stations throughout the country. The Bureau is a part of the Department of Agriculture's Agricultural Research Administration and conducts a great deal of its work in cooperation with State agricultural experiment stations, as well as with many private agencies. Results of its past research are now in common use, and many of the recent results of the work—redirected for maximum wartime effectiveness—have been eagerly and effectively applied by American farmers.

GROWERS MAKING WIDE USE OF RESEARCH RESULTS

Hybrid corn varieties created by plant breeders have, for example, been so widely and successfully used that the Nation's 1942 corn crop was increased more than 600 million bushels by this one factor.

Six new varieties of oats have been so promptly and so widely adopted by farmers that the increased per acre yields they make possible have enabled the growers to maintain their total production on fewer acres—thus freeing additional lands for the more urgently needed war crops. Half the oat acreage of Iowa and Wisconsin, a third that of Illinois, and some half-million acres in adjoining States—a total of close to 6,000,000 acres—was sown to these varieties in 1943.

Ten of the new varieties of potatoes distributed to growers through the National Potato Breeding Program during the past 10 years made up more than 28 percent of the Nation's certified potato seed in 1942 and accounted in part for a great increase in the average yield per acre. In 1942 the average yield of potatoes was 136 bushels per acre—13.4 bushels more than the 10-year average for 1930 to 1939.

More than 97 percent of the acreage devoted to sugarcane production in Louisiana in 1942 grew disease-tolerant varieties bred and developed or introduced and selected by sugar-plant specialists.

A third of all the railroad refrigerator cars that haul fruits and vegetables are now equipped for stage icing—that is, for placing the ice on the stage (or false bottom) halfway up the bunker rather

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than filling it—a practice that not only drastically reduces ice and transportation costs but also cuts freight loads at a critical time.

A new use for chemical growth-regulating substances, discovered only 4 years ago, became so widespread among orchardists in 1942 that the resulting savings were estimated at $3,000,000. Between 75,000 and 80,000 acres of apple and pear orchards, it was estimated, were then sprayed with these chemicals to make the fruit stay on the trees till picking time. And their use for these fruits has continued to expand. Preventing preharvest drop in this way not only has protected the fruit from damage in falling to the ground but has also made it possible to pick orchards systematically, instead of moving crews to the areas where dropping occurs.

The Victory Garden campaign has brought the greatest expansion yet known in the numbers of people making use of the results of plant research—a campaign managed for the Department of Agriculture by the head of the Bureau's Division of Information and made informative in the most practical way through the availability of the results of plant research. More than 3,000,000 copies of the publication Victory Gardens were distributed in the spring of 1943, and in many other ways the facts about successful gardening were brought home to more than 20,000,000 wartime gardeners.

FURTHER DEVELOPMENTS STILL MORE PROMISING

Seeing the results of past research thus applied gives added meaning to new developments. Of great potential importance, for example, are the new varieties of crop plants released or distributed during the past year. The reasonable expectation that they will be promptly adopted by growers gives them added significance. Thirty-five such new varieties were reported for 1943, for 14 crops—wheat, rice, flax, cotton, alfalfa, soybeans, potatoes, snap beans, lima beans, red raspberries, peaches, strawberries, sugarcane, and tobacco. Bred not only for adaptation to particular regions, for resistance to disease, which is often a major consideration, and for hardiness, but also for higher yields and for special purposes, the new varieties of food, feed, and fiber crops being thus developed by plant breeders are gradually bringing about a revolution in American agriculture, and American farmers are fast making the changes. Pilot and Rival, two varieties of wheat first grown by farmers in 1939, have, for example, already come to be used on about 2,500,000 acres, replacing on these acres the excellent variety Thatcher. Similar replacements are being made with other crops to such an extent that it is interesting to speculate on how soon the varieties grown by a previous generation of farmers will have been completely replaced by better varieties.

Added to these contributions of plant breeders are those of soil scientists who are making possible an increasingly efficient and discriminating use of the land, fertilizer specialists who are pointing the way to more economical and effective ways to manufacture and use fertilizers, and agricultural engineers who are developing improved and labor-saving methods, machines, and equipment for carrying on all the operations of agriculture. All these workers in agricultural research are at the same time striving to improve cultural practices and to make possible a coordinated use of all new developments.

The past year has seen significant developments. Ways to make safe and economical use of war-plant byproducts for fertilizers have

been demonstrated, and a new way has been devised to measure the tendency of a fertilizer to introduce too much soluble salt into the soil, thus providing the first convenient index to the seedling-burning hazards of a fertilizer. A single-row peanut planter for use by farmers with one-mule equipment in opening beds and planting the peanuts in one operation is among the advances in agricultural engineering. Shearing sugar-beet seed—that is, reducing the many-germ seedballs to a single germ—has been proved to be practical in western irrigated districts to save labor in thinning the plants. Sowing in submerged rice fields in California has been shown to be a safe practice that eliminates a labor cost for weeding of $3 to $5 an acre.

RESEARCH WORK MOBILIZED FOR WAR

These current research undertakings have thus made many contributions to the future of American agriculture, yet they have been carried on with the immediate purpose of helping to meet the needs of a nation at war—needs for maximum production of food, feed, and fiber, for conserving manpower and avoiding unnecessary use of materials, and for minimizing the demands of agriculture on industry and on transportation. Many other activities have been undertaken or given added emphasis to meet special war needs.

Abacá plantings have been advanced in Latin America to provide Manila hemp formerly imported for marine cordage but not now thus available, and in this country hemp production has been aided to provide the best domestic substitute for abacá. Waxy varieties of cereals have been developed to meet needs for domestic substitutes for the cassava starch formerly imported and especially needed now in the manufacture of adhesives. Belladonna and henbane production has been insured to meet emergency needs for these drug plants. Research has prepared the way for castor bean production for oil. Rubber plant production both in this country and elsewhere in the Western Hemisphere has been hastened and made more efficient by special rubber-plant investigations. Cinchona seeds have been grown in the United States, and the seedlings, flown to Central and South America, have been grown there for quinine production. The use of woods in aircraft, boat, and war-housing production has been made more efficient and less wasteful through wood-disease studies. Protection of fabrics from mildew and rot in tropical countries has been made more effective. Substitutes for scarce materials have been tested.

The wartime opportunities of the Bureau of Plant Industry, Soils, and Agricultural Engineering have thus been realized to a great extent in finding out the ways to produce special crops and meet emergency needs and in informing American farmers regarding many crops with which they have not been familiar. Yet perhaps even a greater service has been the help rendered in producing our normal, basic crops in greater quantities and better quality, despite labor shortages and other limitations.

ORGANIZATION OF THE BUREAU'S WORK

The Agricultural Research Administration's work in agricultural engineering was combined in February 1943 with that of the Bureau of Plant Industry, and at the same time the name of this Bureau was changed for the first time since its establishment in the United States

Department of Agriculture in 1901. The work of the Bureau—one of seven agencies in the Agricultural Research Administration—now comprises investigations of soils, fertilizers, plants, farm machines and structures, and methods of growing, harvesting, storing, and doing certain primary processing of crops.

Soils are studied from the standpoint of their distribution, adaptation to use, and management. By means of surveys and maps—combined with experiments in the field, greenhouse, and laboratory—systems of management for efficient crop production and soil improvement are determined for the Nation's important agricultural soils. Problems of soil fertility, fertilizers, soil tilth and tillage, drainage and irrigation, salinity, and soil-borne plant diseases are all involved.

Fertilizer investigations include the development of improved materials and more efficient methods of manufacture and use.

Research with plants is concerned with reducing production hazards and improving the quality of crops. One of the principal ways of doing this is by breeding new strains or varieties that are resistant to disease, heat, drought, or cold. Many of these result from plant exploration and introductions from other countries. Other studies are concerned with weed control and methods of planting, harvesting, transportation, and storage of crop plants.

Agricultural engineering research includes the design of new machines or the improvement of old ones; development of new methods of carrying out farm operations, including seedbed preparation, planting, cultivation, harvesting, storing, and primary processing; and the design of farm buildings and equipment. The Bureau maintains experimental farms, greenhouses, and laboratories at its national headquarters at the Plant Industry Station, Beltsville Research Center, Beltsville, Md., and conducts research in cooperation with the State agricultural experiment stations and at various field stations and laboratories throughout the country. It also administers the National Arboretum at Washington, D. C.

Organized in 17 units, the work is administered as follows:

Chief of Bureau	Robert M. Salter
Assistant Chief	F. P. Cullinan
Assistant Chief	M. A. McCall
Agricultural Engineering	Geo. R. Boyd
Cereal Crops and Diseases	M. A. McCall
Cotton and Other Fiber Crops and Diseases	H. W. Barre
Drug and Related Plants	D. M. Crooks
Dry Land Agriculture	C. E. Leighty
Forage Crops and Diseases	Olaf S. Aamodt
Forest Pathology	Lee M. Hutchins
Fruit and Vegetable Crops and Diseases	J. R. Magness
Irrigation Agriculture	C. S. Scofield
Mycology and Disease Survey	H. A. Edson
Nematology	G. Steiner
Plant Exploration and Introduction	B. Y. Morrison
Rubber Plant Investigations	E. W. Brandes
Soil and Fertilizer Investigations	F. W. Parker
Soil Survey	Charles E. Kellogg
Sugar Plant Investigations	E. W. Brandes
Tobacco Investigations	W. W. Garner

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